

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No. : 10/804,684
Applicant : Michael J. Ziegler et al.
Filed : March 19, 2004
Title : EPOXY POLYMER ADDITIVES FOR
POWDER COATINGS
Group Art Unit : 1712
Examiner : Sellers, Robert E.
Confirmation No. : 8171
Customer No. : 24959
Attorney Docket No. : 1923A1/RC

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicants hereby appeal the final rejection in the above-referenced matter as set forth in the Office Action mailed February 28, 2007. Applicants submit this Appeal Brief pursuant to 37 C.F.R. § 41.37.

REAL PARTY IN INTEREST

PPG Industries Ohio, Inc. is the real party in interest, as evidenced by the Assignment filed at Reel 015123, Frame 0614.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

STATUS OF CLAIMS

Claims 1-22 are pending. All claims stand rejected and appealed.

STATUS OF AMENDMENTS

No amendment was filed subsequent to the final rejection.

SUMMARY OF CLAIMED SUBJECT MATTER

The present invention is directed to curable powder coating compositions that comprise a film-forming resin, a crosslinker, and a polymer additive. See paragraph [0006]. The polymer additive comprises the reaction product of an epoxy resin having at least one hydroxyl group and a lactone and has a melting temperature in the range of about 40 to about 65°C. See paragraphs [0006], [0012]. Suitable epoxy resins for preparing the foregoing additive resin are described in paragraphs [0007] and [0008]. Suitable lactones for preparing the foregoing additive are described in paragraph [0009]. The grafting of the lactone to the epoxy resin is described in paragraphs [0010] and [0011]. As indicated in paragraph [0012], the additive, in some cases, has an epoxy equivalent weight of 10,000 to 150,000, and, as indicated in paragraph [0023], is, in some cases, present in the powder coating composition in an amount ranging from 0.1 to 20 weight percent, based on total weight of the coating composition.

Suitable film-forming resins for the powder coating compositions of the present invention are described in paragraphs [0013] to [0017]. Suitable crosslinkers for the powder coating compositions of the present invention are described in paragraphs [0018] to [0019].

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1-20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 4,522,984 ("Watanabe") and U.S. Patent No. 5,037,899 ("Nakamura") in view of Japanese Patent No. 53-58536 (the "Japanese Patent").
2. Claims 21-22 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe in view of the Japanese Patent.
3. Claims 1-21 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the Japanese patent in view of Watanabe and Nakamura.

ARGUMENT

Applicants submit that the Examiner has not, and cannot, establish a *prima facie* case of obviousness with respect to any of the grounds of rejection to be reviewed. Where, as here, the Examiner does not establish a *prime facie* case of obviousness, the applicant need not submit any evidence of nonobviousness in rebuttal, and the case should proceed to allowance. *In re Rijckaert*, 9 F.3d 1531, 1352, 28 USPQ2d 1955 (Fed. Cir. 1993). Each ground of rejection is considered in detail below.

A. The Examiner Has Not, And Cannot, Establish A Prime Facie Case of Obviousness Of Claims 1-20 Over Watanabe And Nakamura In View Of The Japanese Patent.

The Examiner asserts that Watanabe discloses a powder paint (col. 6, lines 67-68) comprising a lactone-modified epoxy resin combined with a blocked isocyanate. See Office Action mailed 6/20/2006 ("Office Action 1") at p. 4. The Examiner further asserts that Nakamura reports a powder coating (col. 5, lines 8-21) prepared from the reaction of a lactone with the reaction product of a bisphenol epoxy resin and a primary amine blended with a curing agent. See Office Action 1 at p. 4. The Examiner further asserts that the Japanese Patent espouses a powder coating produced from 2% by weight of an epoxy resin, an ϵ -caprolactam-blocked

isophorone diisocyanate and 68.2% by weight of a hydroxyl-functional polyester. See Office Action 1 at p. 5. The Examiner concludes that it would have been obvious to formulate the powder coatings of Watanabe and Nakamura via the incorporation of a hydroxyl-functional polyester of the Japanese patent. See Office Action 1 at p. 5.

Applicants respectfully traverse the foregoing rejection. In particular, Applicants argue the patentability of claims 1-16 and 18-20 as a group. Applicants assert that claim 17 is separately patentable.

1. Claims 1-16 and 18-20

The present invention is directed to the use, in a powder coating composition, of a polymer additive that is the reaction product of an epoxy resin having at least one hydroxyl group and a lactone, wherein the polymer additive has a melting temperature in the range of about 40 to about 65°C. Notably, as Applicants have previously pointed out to the Examiner, because the melting temperature of this additive is within the foregoing range, it is not a free flowing powder. Therefore, it would not be expected to be used effectively as a powder coating composition. Applicants, however, have discovered that a free flowing powder coating composition can be produced, even with the inclusion of such an additive, if it is used in combination with other coating components that do produce a free flowing powder and if it is used in an amount that does not prevent the production of a free flowing powder coating composition. Furthermore, Applicants have discovered that a free flowing powder coating composition can be produced, even with the inclusion of such an additive, to provide a powder coating composition with improved properties, such as improved flow and/or improved leveling, decreased gassing, increased flexibility, and/or improved appearance. See paragraph [0023].

There is no disclosure or suggestion in Watanabe or Nakamura that such a polymer having such a melting temperature can be used in a powder coating composition, much less in a powder coating composition in combination with a film-forming resin and a crosslinker.¹ Watanabe, for its part, broadly discloses the reaction of an epoxy resin and ϵ -caprolactone at ratios of 97 to 5 parts by weight of the former and 3 to 95 parts by weight for the latter,

¹ Applicants' specification makes clear that the polymer additive is not a "film-forming resin" for purposes of the present invention. See paragraph [0023] ("Thus, the 'film-forming resin' as used herein does not refer to the comb polymer.").

preferably 95 to 30 parts by weight for the former and 5 to 70 parts by weight for the latter. See col. 5, lines 55-63. The extent of Watanabe's teaching with respect to the use of such a polymer in a powder coating composition, however, is the following sentence:

Moreover, the modified epoxy resin may be used as a powder paint by mixing it with a blocked isocyanate.

See col. 6, lines 67-68 (emphasis added).

Thus, as is clear from the foregoing, Watanabe only contemplated use of the lactone-modified epoxy resin "as" a powder paint, not as an additive in a powder coating composition in combination with a film-forming resin and a crosslinker, as is present claimed. Importantly, however, a lactone-modified epoxy resin having a melting temperature in the presently claimed range of about 40 to about 65°C will not, as Applicants have pointed out, be a free flowing powder and would, therefore, be suitable for use effectively "as" a powder paint. Thus, Applicants strenuously assert that Watanabe neither discloses nor suggests the inclusion of lactone-modified epoxy resin having a melting temperature within the claimed range in a powder coating composition at all. Indeed, to further illustrate the point, Applicants note that all of the modified epoxy resins described in the Examples of Watanabe (including Examples 1 and 2 cited by the Examiner, particularly Example 2 which had a melting temperature within the presently claimed range) were used in the production of liquid coatings, not powder coatings. See Watanabe at col. 11, line 25 to col. 12, line 5.

Applicants view the teachings of Nakamura similarly. Nakamura simply states that:

Improved powder coatings may be prepared by combining the modified epoxy resin of the present invention with curing agents

....

See Nakamura at col. 5, lines 8-21.

Yet, Nakamura fails to disclose or suggest the inclusion of a lactone-modified epoxy resin having a melting temperature in the presently claimed range of about 40 to about 65°C in a powder coating composition. Indeed, each and every one of the modified epoxy resins prepared in the Examples of Nakamura that were used in the preparation of a powder coating composition had a softening point of over 100°C. See Nakamura at col. 5, line 53 to col. 6, line

63 and Table 1. As a result, Applicants strenuously assert that Nakamura neither discloses nor suggests the inclusion of lactone-modified epoxy resin having a melting temperature within the claimed range in a powder coating composition at all.

To establish a *prima facie* case of obviousness, the prior art reference or combination of references must teach or suggest all of the limitations of the claims. *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970). Moreover, the prior art relied upon, coupled with the knowledge generally available in the art at the time of the invention, must contain some teaching, suggestion or incentive that would have motivated the skilled artisan to modify a reference or to combine references in the particular manner claimed. *Karsten Mfg. Corp. v. Cleveland Golf Co.*, 242 F.3d 1376, 1385, 58 USPQ2d 1286, 1293 (Fed. Cir. 2001); *In re Kotzab*, 217 F.3d 1365, 1371, 55 USPQ2d 1313 (Fed. Cir. 2000) ("Particular findings must be made as to the reason the skilled artisan, with no knowledge of the claimed invention, would have selected these components for combination in the manner claimed"). Finally, the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made, not hindsight. *Amgen, Inc. v. Chugai Pharm. Co.*, 927 F.2d 1200, 1209, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991).

Here, the Examiner has not, and cannot, identify any teaching or suggestion in either Watanabe or Nakamura of the inclusion, in a powder coating composition, of a polymer additive that is the reaction product of an epoxy resin having at least one hydroxyl group and a lactone and which has a melting temperature in the range of about 40 to about 65°C. The Japanese patent does nothing to overcome this critical deficiency of both Watanabe and Nakamura (the Examiner has not asserted otherwise). Furthermore, the Examiner has not, and cannot, identify any teaching, suggestion or incentive that would have motivated the skilled artisan to modify either Watanabe or Nakamura in the particular manner claimed, namely, to include a polymer additive that is the reaction product of an epoxy resin having at least one hydroxyl group and a lactone and which has a melting temperature in the range of about 40 to about 65°C in a powder coating composition with a film-forming resin and a crosslinker.

As a result, Applicants submit that the rejection of claims 1-16 and 18-20 under 35 U.S.C. 103(a) over Watanabe and Nakamura in view of the Japanese Patent should not stand.

2. Claim 17

Claim 17 specifies that the polymer additive described above is present in the claimed powder coating composition in an amount of 0.1 to 20 weight percent, based on the total weight of the powder coating composition. Neither Watanabe nor Nakamura disclose or suggest the use of such a polymer in a powder coating composition in such an amount. The Japanese Patent does nothing to overcome this deficiency. As a result, Applicants assert that claim 17 is separately patentable over Watanabe and Nakamura in view of the Japanese Patent. Therefore, Applicants submit that the rejection of claim 17 under 35 U.S.C. 103(a) over Watanabe and Nakamura in view of the Japanese Patent should not stand.

B. The Examiner Has Not, And Cannot, Establish A Prime Facie Case of Obviousness Of Claims 21-22 Over Watanabe In View Of The Japanese Patent.

Claims 21 and 22 depend from claim 1 and, therefore, Applicants assert that they are patentable over Watanabe in view of the Japanese Patent for the reasons discussed earlier with respect to claim 1. Applicants also assert, however, that claim 21 is independently patentable over Watanabe in view of the Japanese Patent.

Claim 21 recites that the epoxy equivalent weight of the polymer additive is 10,000 to 150,000. Watanabe neither discloses nor suggests the use, in a powder coating composition, of a lactone-modified epoxy resin having a melting temperature of about 40 to about 65°C and an epoxy equivalent weight of 10,000 to 150,000 in a powder coating composition with a film-forming resin. As a matter of fact, Watanabe fails to disclose any modified epoxy resin having an epoxy equivalent weight within the claimed range and, notably, the epoxy equivalent weight of all of the modified epoxy resins described in the Examples therein is well outside of the claimed range. As a result, Applicants assert that the Examiner has not, and cannot, establish a *prima facie* case of obviousness of claim 21 over Watanabe in view of the Japanese Patent.

Moreover, while the Examiner concedes that the epoxy equivalent weight range recited in claim 21 is not recited in Watanabe, the Examiner concludes, however, that it would have been obvious to prepare the lactone-modified epoxy resin of Watanabe with epoxy equivalent weights within the claimed parameters in order to maximize the amount of polycaprolactone side chains to optimize the flexibility, heat and water resistance, low temperature properties and

miscibility. See Office Action mailed 2/28/07 at p. 4. Applicants respectfully disagree with this conclusion. Watanabe expressly warns against "maximizing" the amount of polycaprolactone side chains in the lactone-modified epoxy resin described therein. See col. 5, lines 59-62 ("If the quantity of ϵ -caprolactone ... is too much, the cured articles are excessively flexible.").

For the foregoing reasons, Applicants submit that the rejection of claim 21 and 22 under 35 U.S.C. 103(a) over Watanabe in view of the Japanese Patent should not stand.

C. The Examiner Has Not, And Cannot, Establish A Prima Facie Case of Obviousness Of Claims 1-21 Over The Japanese patent In View Of Watanabe and Nakamura

As previously indicated, the Examiner asserts that the Japanese Patent espouses a powder coating produced from 2% by weight of an epoxy resin, an ϵ -caprolactam-blocked isophorone diisocyanate and 68.2% by weight of a hydroxyl-functional polyester. See Office Action 1 at p. 5. The Examiner concedes that the epoxy resin of the Japanese patent does not mention the claimed hydroxyl group-containing epoxy resin reacted with a lactone. *Id.* at p. 6. The Examiner concludes, however, that it would have been obvious to include the lactone-modified epoxy resins of Watanabe and Nakamura in the powder coating of the Japanese patent in order to increase the flexibility and improve the heat and water resistance, low temperature properties, and miscibility. *Id.*

Applicants respectfully traverse the foregoing rejection. In particular, Applicants argue the patentability of claims 1-20 as a group. Applicants assert that claim 21 is separately patentable.

1. Claims 1-20

The Japanese Patent describes a powder coating composition consisting of: (1) 50-95 wt % of a polyester having an abundance of hydroxyl groups; (2) 0.5-30 wt% of a polyester with an abundance of carboxyl groups; (3) 3-40 wt % of a blocked polyisocyanate; and (4) 0.5-20 wt% of an epoxy resin. See Japanese Patent at 2.² The Japanese Patent clearly states that the epoxy resin is the component that reacts with the carboxyl groups in the polyester resin and has an average functionality of two or more epoxy groups per molecule. See Japanese Patent

² A certified translation of the Japanese Patent is included with Evidence Appendix attached hereto.

at p. 3, lines 21-22. As a result, in the Japanese patent, the epoxy resin acts as a crosslinker with the carboxy functional polyester to form a crosslinked network. A second crosslinked network is formed from the reaction of the blocked polyisocyanate with the hydroxy functional polyester. Thus, the result is two crosslinked networks.

By contrast, the modified epoxy resins described in Watanabe are formed from an epoxy resin having pendant hydroxyl groups and two epoxy groups per molecule. See Watanabe at col. 4, line 55 to col. 5, line 48 and the Examples. Applicants have submitted evidence in the form of an inventor declaration that these modified epoxy resins of Watanabe, as well as other examples of a polymer that is the reaction product of an epoxy resin having pendant hydroxyl groups and two epoxy groups per molecule, and a lactone have an average of less than two epoxy groups per molecule. See Declaration Under 37 CFR 1.132 ¶ 3-4. (hereinafter the "Ziegler Declaration").³ This is because, during reaction of the epoxy resin with the lactone, some of the epoxy groups are consumed. *Id.* Because of this, one skilled in the art would not have been motivated to use the modified epoxy resins described in Watanabe as the epoxy resin in the Japanese reference, because it would not be expected to perform well as a crosslinker for the carboxy functional polyester described in the Japanese reference. *Id.* at ¶ 5. Reduced crosslink density may result in poor physical properties especially hardness, solvent resistance, and flexibility, which is directly contrary to the goals of the compositions described in the Japanese patent. *Id.* Accordingly, the Examiner has not, and cannot, establish a *prima facie* case of obviousness with respect to claim 1, as amended herein, over the Japanese patent in view of Watanabe. See, e.g., *In re Fritch*, 972 F.2d 1260, 1265, n.12, 23 USPQ2d 1780, 1783 n.12) (Fed. Cir. 1992) ("A proposed modification [is] inappropriate for an obviousness inquiry when the modification render[s] the prior art reference inoperable for its intended purpose").⁴

³ A copy of the Ziegler Declaration is with the Evidence Appendix attached hereto.

⁴ Applicants note that the Examiner appears to dispute the Ziegler Declaration by relying on the disclosure of Watanabe at col. 4, lines 39-43, by asserting that "the lactone reacts only with the hydroxyl groups of the epoxy resin, thereby leaving the epoxy groups unreacted." See Office Action mailed 2/28/07 at p. 3. Applicants respectfully disagree with the Examiner's interpretation of the cited portion of Watanabe. The cited passage reads "[t]he lactone-modified epoxy resin used in this invention has polycaprolactone side chains bonded directly to the epoxy resin as the result of ring opening polymerization of ϵ -caprolactone with hydroxyl groups present in the epoxy resin per se." Applicants assert that nothing in this passage contradicts with anything in the Ziegler Declaration.

As a result, Applicants submit that the rejection of claims 1-20 under 35 U.S.C. 103(a) over the Japanese Patent in view of Watanabe and Nakamura should not stand.

2. Claim 21

Claim 21 depends from claim 1 and, therefore, Applicants assert that it is patentable over the Japanese Patent in view of Watanabe and Nakamura for the reasons discussed earlier with respect to claim 1. Applicants also assert, however, that claim 21 is separately patentable over the Japanese Patent in view of Watanabe and Nakamura.

Claim 21 recites that the epoxy equivalent weight of the polymer additive is 10,000 to 150,000. Neither Watanabe nor Nakamura disclose any modified epoxy resin having an epoxy equivalent weight within the claimed range. As a result, Applicants assert that the Examiner has not, and cannot, establish a *prima facie* case of obviousness of claim 21 over the Japanese Patent in view of Watanabe and Nakamura.

Moreover, while the Examiner concedes that the epoxy equivalent weight range recited in claim 21 is not recited in Watanabe, the Examiner concludes, however, that it would have been obvious to prepare the lactone-modified epoxy resin of Watanabe with epoxy equivalent weights within the claimed parameters in order to maximize the amount of polycaprolactone side chains to optimize the flexibility, heat and water resistance, low temperature properties and miscibility. See Office Action mailed 2/28/07 at p. 4. Applicants respectfully disagree with this conclusion. Watanabe expressly warns against maximizing the amount of polycaprolactone side chains in the lactone-modified epoxy resin described therein. See col. 5, lines 59-62, *supra*.

For the foregoing reasons, Applicants submit that the rejection of claim 21 under 35 U.S.C. 103(a) over the Japanese Patent in view of Watanabe and Nakamura should not stand.

3. Claim 22

Applicants wish to clarify that the Examiner does not appear to reject claim 22 over the Japanese Patent in view of Watanabe and Nakamura. Applicants respectfully assert that this claim is also separately patentable over the cited references.

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For all of the foregoing reasons, it is respectfully requested that the case be remanded to the Examiner for issuance of a Notice of Allowance.

Respectfully Submitted,

A handwritten signature in dark ink, appearing to read "Donald R. Palladino", is written over a horizontal line.

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CLAIMS APPENDIX

1. A curable powder coating composition comprising:
 - (a) a compound that comprises the reaction product of an epoxy resin having at least one hydroxyl group and a lactone, wherein the compound has a melting temperature in the range of about 40 to about 65°C;
 - (b) a film-forming resin; and
 - (c) a crosslinker.
2. The composition of Claim 1, wherein the epoxy resin has a number average molecular weight of 1,000 to 20,000.
3. The composition of Claim 2, wherein the epoxy resin has a number average molecular weight of 3,000 to 9,000.
4. The composition of Claim 1, wherein the epoxy resin has an epoxide equivalent weight of 500 to 20,000.
5. The composition of Claim 4, wherein the epoxy resin has an epoxide equivalent weight of 1,000 to 10,000.
6. The composition of Claim 5, wherein the epoxy resin has an epoxide equivalent weight of 2,000 to 4,500.
7. The composition of Claim 1, wherein 1 to 100 percent of the hydroxyl groups have a lactone grafted thereto.
8. The composition of Claim 7, wherein greater than 90 percent of the hydroxyl groups have a lactone grafted thereto.

9. The composition of Claim 1, wherein the reaction product of the epoxy resin and the lactone has a weight average molecular weight of 5,000 to 500,000.
10. The composition of Claim 9, wherein the reaction product of the epoxy resin and the lactone has a weight average molecular weight of 25,000 to 250,000.
11. The compound of Claim 1, wherein the lactone comprises epsilon-caprolactone.
12. The composition of Claim 1, wherein the reaction product of the epoxy resin and the lactone comprises lactone chains comprising 1 to 50 lactone derived units.
13. The composition of Claim 1, wherein the film forming resin is hydroxy functional.
14. The composition of Claim 13, wherein the film-forming resin comprises polyester.
15. The composition of Claim 1, wherein the film-forming resin does not comprise epoxy.
16. The composition of Claim 1, wherein the film forming resin is present in an amount of 50 weight percent or greater, based on total weight of the composition.
17. The composition of Claim 1, wherein the reaction product of epoxy resin and lactone is present an amount of 0.1 to 20 weight percent.
18. The composition of Claim 17, wherein the reaction product of epoxy resin and lactone is present in an amount of 2 to 8 weight percent.
19. The composition of Claim 1, wherein the lactone does not have an amine grafted thereto.
20. The composition of Claim 1, wherein the lactone does not have an acid grafted thereto.

21. The composition of claim 1, wherein the epoxy equivalent weight of the compound (a) is 10,000 to 150,000.

22. The composition of claim 1, wherein the epoxy resin is not chain extended by reaction of the terminal oxirane groups with amines.

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EVIDENCE APPENDIX

A: Certified translation of Japanese Patent No. 53-58536 that accompanied the Amendment dated September 19, 2006. A certification attesting the accuracy of the translation was submitted with the Amendment dated January 10, 2007, whereupon Applicants believe that the translation was entered in the record by the Examiner.

B: Declaration Under 37 CFR 1.132 dated January 8, 2007, which accompanied the Amendment dated January 10, 2007, whereupon Applicants believe it was entered in the record by the Examiner.

C: Declaration Under 37 CFR 1.132 dated September 18, 2006, which accompanied the Amendment dated September 19, 2006, whereupon Applicants believe it was entered in the record by the Examiner.

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RELATED PROCEEDINGS APPENDIX

None.